

Walkability of Boston Public High Schools

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 Class: UEP 232: Introduction to GIS
 Date produced: December 19, 2016

Introduction

The Boston Public Schools district serves over 17,000 high school students among over 30 high schools (“At a Glance”). Students can apply to as many high schools as they want across the city; the district then assigns students to schools. In this application and assignment process, 2 miles is an extremely important distance. BPS uses MBTA rail and bus transit as well as yellow buses to transport students to their schools. Students living 2 or more miles away from their school are provided free transportation. Those within 2 miles of a school are given priority in the application process, but are not guaranteed free transportation (“Discover Boston Public Schools 2016”). 2 miles is a significant distance for a high schooler to walk, particularly in a city as crowded and trafficky (and, in the winter, as prone to snowstorms) as Boston. The use of walk zones thus has important implications from an equity standpoint: Is 2 miles a fair guideline on which to base school preference and availability of free transportation? With this question in mind, this analysis examines the proximity of schools to MBTA stations throughout the city, incorporating median income data by census tract to present a picture of the real accessibility of Boston’s public high schools.

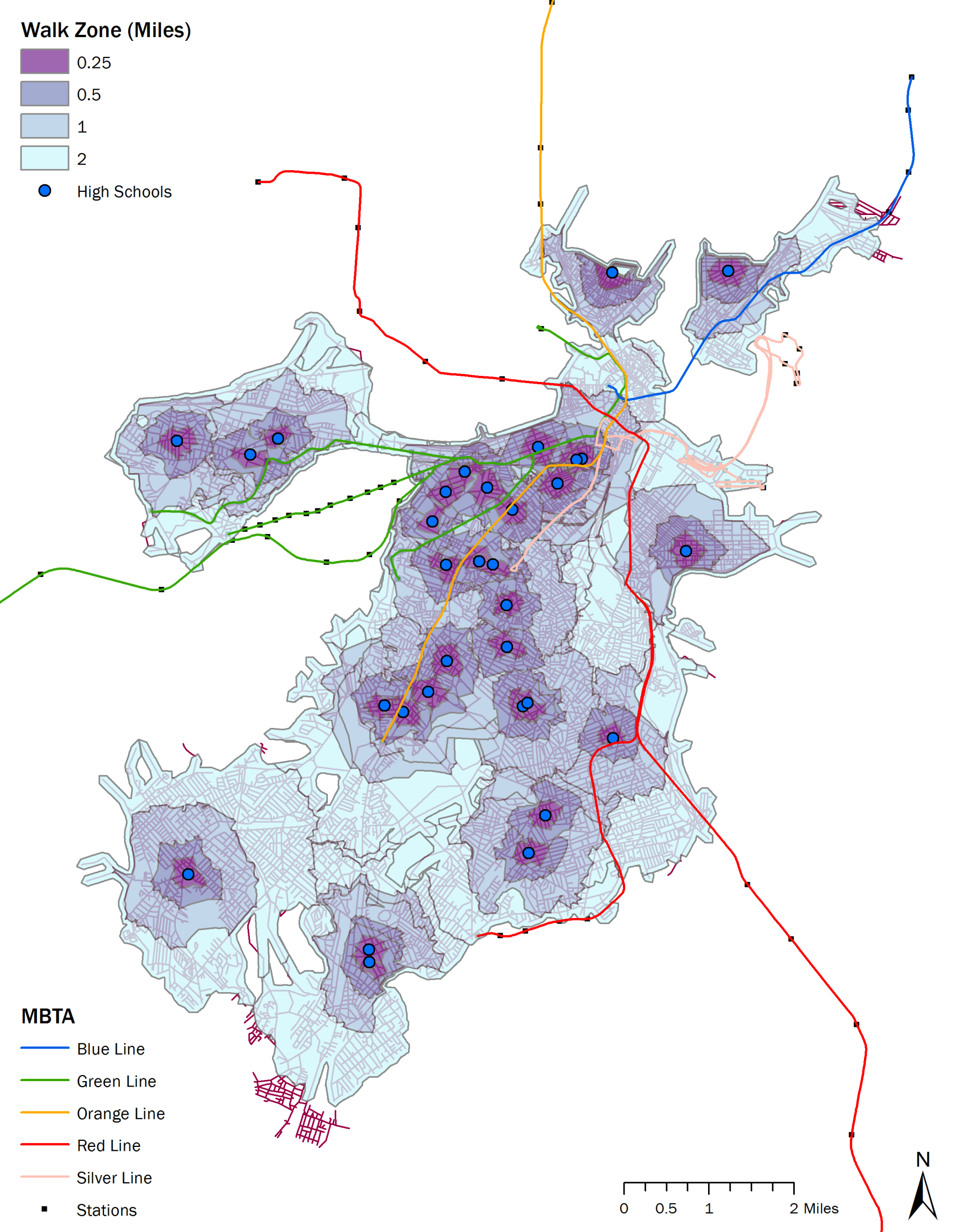
Methods

Geocoding the Schools
 The locations of all Boston Public Schools (from 2012-13) were obtained from the City of Boston’s website. The universe of this analysis is high school students, as the transportation conditions apply to them. In Boston, a total of 37 schools serve grades including, but not limited to, 9-12. School addresses and latitude-longitude coordinates were checked on the BPS Directory and, when unclear, on Google Maps. The schools were geocoded into ArcMap using the Add XY function and their locations were re-checked; then, the schools were projected to State Plane NAD 83 Massachusetts Mainland 2001 (meters).

Adding T Stops and Conducting a Network Analysis
 MBTA line and station shapefiles (MassGIS) and a Boston streetlines shapefile (Tufts S: Drive) were added to the map. A Network was created using schools as facilities with a search tolerance of 0.25 miles. Breaks were created at 400, 800, 1600, and 3200 meters; this equates to approximately 0.25, 0.5, 1, and 2 miles. The polygons that were created from these breaks were saved as a shapefile and symbolized. A spatial join was then conducted, joining the MBTA stations with the shapefile. This was used to create the “School Walk Zones & T Stops” map. The walkability analysis uses schools as facilities instead of homes because they provide a narrower dataset and because walkability between T and school importantly affects student commutes.

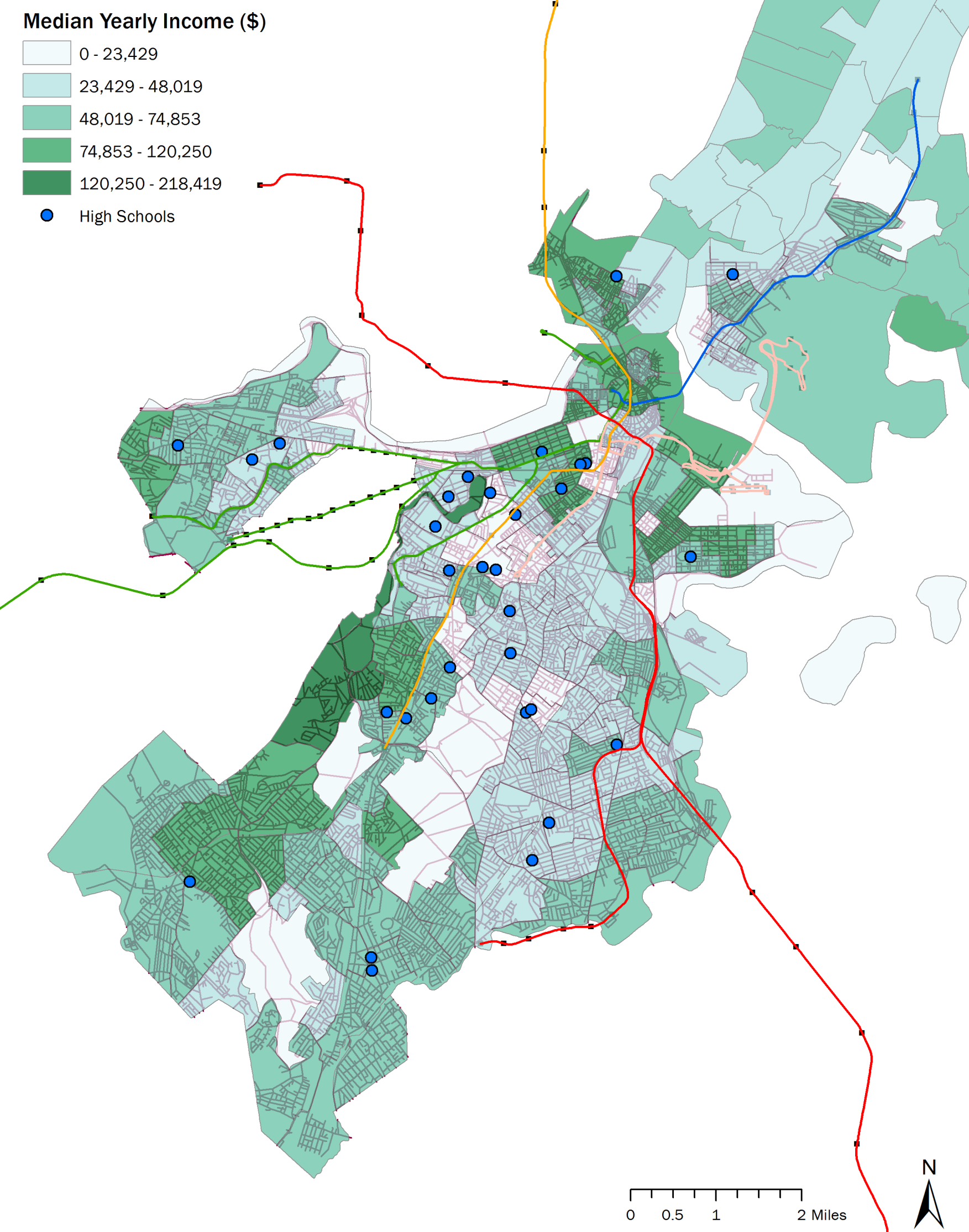
Incorporating Census Data
 Median income data were added by census tract using 2010 ACS 5-year estimates; these data were downloaded from Census.gov and added using 2016 TIGER streetline data to a map containing the walkability network discussed above. Census data are depicted in “School Locations and Census Data.” Census data were spatially joined with schools to create the “Schools, T Proximity, and Median Income” map.

School Walk Zones and T Stops



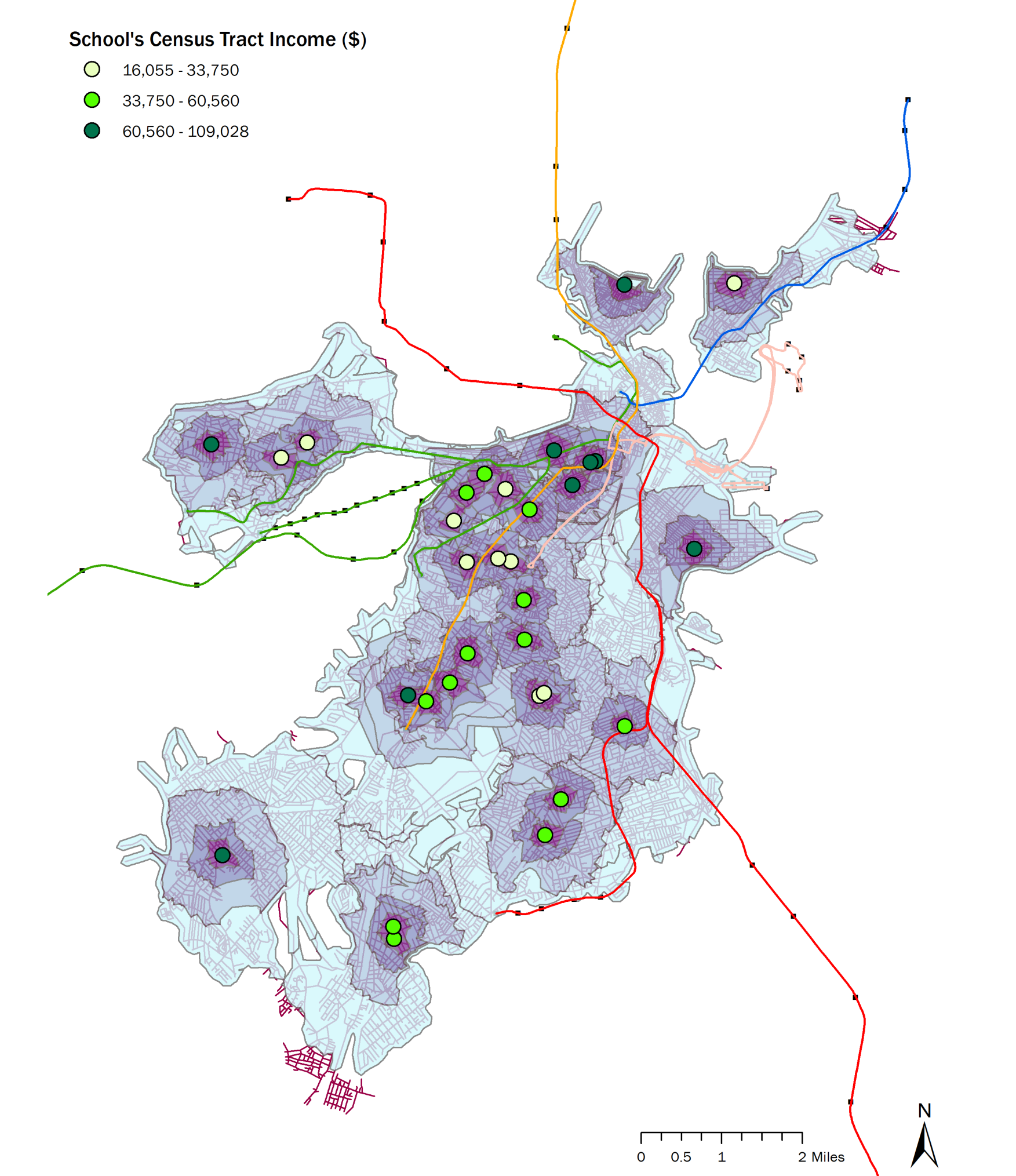
Only 3 of the 37 schools have a T station within 0.25 miles. 20 schools have a T station within 0.5 miles; 27 have a station with 1 mile; and 35 of the 37 schools have a T station within 2 miles. The two schools without any T access within 2 miles are West Roxbury and Urban Science Academy.

School Locations and Census Data



Schools are geographically located within 25 of 204 census tracts in Boston. The average of the mean income in school tracts is \$52,879. This is higher than the overall mean income (\$50,780) and the average mean income of non-school tracts (\$50,487).

Schools, T Proximity, and Median Income



This map combines data from the two maps above to give a picture of schools, their walking proximity to T stations, and the median annual income of the census tract in which the school is located. The three different color dots, which represent schools, are divided on natural breaks into low, middle, and high median income. As the map demonstrates, many of the higher income schools and census tracts are located very close to T stations; however, some of the higher income schools and census tracts are also among the furthest from T stations. It is worth noting that census income is based on the school’s location, not the home locations of the students; as such, this should be seen as a way to look at the income of the area in which the student attends school.

The table below includes more detail about the different proximities and average median income. Number of schools in a given distance refers to schools for which the closest T stop is that distance away, so there is no double-counting for schools with T stops within 0.25 and 0.5 miles.

Distance to T (miles)	Number of Schools	Average Income (\$)
0.25	3	53,906
0.5	17	50,543
1	7	56,569
2	8	41,742

Discussion

With regard to the general proximity and walkability figures, it is important to note the substantial differences in number of schools in the four distance categories. Using BPS’ 2 mile measure, nearly all schools are within walking distance of a T station. Using stricter numbers substantially decreases the number of schools within walking distance: only 3 are within 0.25 miles (a typical walkability metric).

The Locations and Census Data map shows an interesting trend: there appear to be no schools in the census tracts with the very highest median income in Boston (based on the five-part natural breaks division).

As seen in the Schools, T Proximity, and Median Income table below, census tract median income is the by far the lowest for the 8 schools furthest from the T (i.e., those that have the closest T stop between 1 and 2 miles away). There was an unexpected increase in average census median income from the schools with the nearest T within 0.25 to 0.5 miles to those with the nearest T within 0.5 to 1 miles. It was expected that there would be a stronger positive correlation between proximity to T and median income: i.e., that the schools (and census tracts) closest to T would all have the highest median income, and those furthest would have the lowest median income. This may not have occurred in part due to the lack of double-counting of schools.

Conclusion

It seems that 2 miles may be too large a distance to use as a guideline for admission preferences and free transportation availability. Though students’ home locations vs. school locations are not analyzed here, the fact that 35 out of 37 high schools are within 2 walking miles of a T station while only 27 are within 1 mile indicates a significant gap. Boston Public Schools has budgeted over \$94 million in transportation funding for School Year 2016-17 (“At a Glance”). Creating a smaller walk zone for students and/or increasing the percentage of seats reserved for walk zone students might increase the number of students located close enough to their schools to need less transportation, lessening BPS costs and importantly lightening the commute these students,.

This analysis does not consider the social and educational benefits of interacting with students across the city. Further research might take this into account. Such research might also examine all BPS high school students’ home and school locations and typical commute times. This could give a more complete picture of students’ commute experiences, which would be valuable in determining the most appropriate walk zone.

Projection: Massachusetts State Plane NAD 83 (2001) (meters) (Lambert Conformal Conic)
 Data sources: MBTA data from MassGIS, Boston streetlines data from Tufts S: Drive (S:\Classes\UEP_254_Fall2016\Lab5\Boston_Network.gdb\Boston\bostonstreets_Project), BPS data from City of Boston.
 Works Cited:
 “Boston Public Schools at a Glance 2016-2017.” *Boston Public Schools Communications Office*. 2016.
 “Discover Boston Public Schools 2016 High School Edition.” *Boston Public Schools*. November 2015.